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West Virginia Fresh Market Apples

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WEST VIRGINIA UNIVERSITY
Bulletin 656
March 1977



West Virginia University
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SUMMARY

Apple production accounts for approximately \$18 million or 48 percent of West Virginia's annual crop sales. Approximately half of the apples produced are sold in the fresh market and half in the processing market. Seasonal unload data indicate that West Virginia producers sell a large percentage of their fresh apples in the fall market when prices are at a seasonal low.

The purpose of this study was to determine the effect of alternative marketing patterns on adjusted net returns from West Virginia apples sold in the Baltimore fresh market. Five-year average monthly data (1969-73) for unloads, retail prices, growers' share of retail value plus quarterly price flexibility coefficients for the 1968-69 season, and storage cost estimates were used in a linear program model to analyze different marketing patterns.

In the normal marketing pattern (Solution I), five-year average monthly data for all states reporting unloads of apples in the Baltimore market were used to determine the net income to West Virginia producers—\$555,401. This return served as the basis for comparing net returns obtained in other solutions.

When West Virginia's marketing pattern was reversed (Solution II), net returns increased to \$606,561. The return in Solution II was \$51,160, or \$8 per thousand pounds greater than Solution I.

When West Virginia's average annual unloads were divided by nine to obtain an even monthly volume for the market season (Solution III), net return was \$585,783. The return in Solution III was \$20,778, or \$4 per thousand pounds less than Solution II. Since the adoption of Solution III required a smaller increase in CA storage capacity and a more gradual change than the reversed marketing pattern in Solution II, Solution III was used for analyzing three additional alternatives.

In Alternative I the five-year average monthly unloads from Washington were decreased ten percent. Total net return to West Virginia growers was \$587,487, or \$1,704 greater than Solution III.

In Alternative II, unloads from Washington were increased ten percent for each month. Total net return for West Virginia was \$584,080. This return was \$3,407 less than Alternative I.

In Alternative III, unloads from West Virginia were increased ten percent each month. Total net return for the season was \$642,421. This return was the largest of all solutions and alternatives tested but the net return per thousand pounds was the same as for Solution III, Alternative I, and Alternative II.

ACKNOWLEDGMENT

This bulletin is published as a contribution to the Northeast Regional Marketing Research Project (NE-88). The West Virginia research for this publication was supported by both state and regional research funds.

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Impact of Alternative Marketing Patterns for West Virginia Fresh Market Apples

Howard R. Scott and Robert L. Jack

West Virginia's annual apple production of approximately 200 million pounds ranks seventh in commercial apple production in the United States, and fifth among the eastern states. Nearly one-half, or 100 million pounds, of the production goes into fresh sales each year. In 1973, cash farm receipts in West Virginia totaled \$152.6 million. All crops accounted for \$37.1 million, and apples accounted for \$17.9 million or 48 percent of the state's annual crop sales.¹

Unload data² indicate the principal outlets for West Virginia apples which are sold for fresh consumption are the Baltimore, Philadelphia, Pittsburgh, and Washington, D.C., markets. West Virginia growers market a large proportion of their apples soon after harvest when prices are low. However, growers from other states continue to supply markets during the last half of the season when the prices are high. Current marketing patterns used by West Virginia growers possibly could be improved by extending the marketing period through greater usage of controlled atmosphere (CA) storage.

PURPOSE

The purpose of this study was to analyze how a change in sales distribution affected net income received by West Virginia growers who sold apples in the Baltimore fresh market over the entire market season.

METHODOLOGY

This study analyzed marketing of apples produced in the Appalachian District, with the greatest emphasis on West Virginia. The Baltimore fresh apple

¹United States Department of Agriculture. *Farm Income State Estimates 1949-1973*. Economic Research Service, FIS 224 Supplement, September 1974.

²"Unload data" means the number of carlots that were reported by month and origin. Through December 1970, a carlot consisted of 820 cartons weighing an average of 42.5 pounds. Beginning January 1971 a carlot consists of 900 cartons with an average weight of 42.5 pounds.

market served as the basis for analysis since West Virginia growers sell nearly fifty percent of their reported unloads through this market.³

Secondary data comprised the larger portion of the data used in the study. Linear programming was used (MPS-360 Control Program) with the objective of maximizing net returns from the sales of West Virginia apples in the Baltimore fresh market during the 1969-73 crop years. Five-year average retail price by months, volume of apples sold by month and origin, grower's share of retail value, and cumulative cost for storage of apples were used in the program. With this information, the problem was to determine if net return to West Virginia growers could be increased by distributing sales more evenly throughout the market season.

Definitions of Concepts

The following discussion is included to give the reader an understanding of the concepts and how data were used to calculate figures presented in this study.

Quantity Marketed. The volume of fresh apples used in the analysis was the average quantity marketed by month and origin for the years 1969-73. Apple unloads in Baltimore from Washington, West Virginia, and other states were tabulated for each month of the five years and averaged to derive an average or representative year to use in the analysis.

Retail Prices. Monthly retail prices per pound for fresh apples sold in the Baltimore market from the 1968-69 crop through the 1973-74 crop were used to compute a five-year average annual and average monthly price.⁴ By using the average retail price, any bias introduced by a large or small crop of apples was minimized. Since the price included all apples sold, regardless of grade, the retail prices used may be biased downward (Appendix A).

Price Flexibilities. A price flexibility coefficient indicates the percentage change in price associated with a one percent change in quantity supplied. Edman's price flexibility coefficients⁵ for apples were used to estimate the impact a change in monthly or annual quantity would have on retail price in the Baltimore market. These coefficients were used in the analysis of the various alternatives examined in this study (Appendix B).

³United States Department of Agriculture, *Fresh Fruit and Vegetable Unloads in Eastern Cities, 1967-73* (Washington, D.C.: Consumer and Marketing Service, Fruit and Vegetable Division, Market News Branch).

⁴Alfred J. Burns and Joseph C. Podany, *Prices and Spreads for Selected Fruits Sold Fresh in Major Markets, 1967/68-1973/74*, Economic Research Service, Agricultural Economic Report No. 295 (Washington, D.C.: United States Department of Agriculture, August 1973) pp. 3-25.

⁵Victor G. Edman, *Retail Demand for Fresh Apples*, Economic Research, Marketing Research Report 952 (Washington, D.C.: United States Department of Agriculture, April 1972) pp. 12-13.

Total Retail Value. Total annual and monthly retail values were determined by multiplying quantity of apples marketed by average retail price.

*Growers' Gross Return.*⁶ Data for growers' share of retail value were taken from a study published by the Economic Research Service⁷ (Appendix C). This study provided growers' share of retail value for Washington Red Delicious and Eastern Red Delicious apples marketed in New York City. The areas of production included in the eastern area were New England, New York, New Jersey, Pennsylvania, Maryland, Delaware, Virginia, West Virginia, North Carolina, and South Carolina. An analysis of apple prices in Baltimore and New York City indicated very little difference in price between the two cities. Therefore, New York data were used since it was the only eastern city for which a growers' share of retail value for Washington apples was reported. Growers' share for each month, October through June, was available for the years needed. Data from 1969-73 for each month were averaged to get a representative growers' share of retail value by month. Growers' gross returns were obtained by multiplying total retail value by the growers' average share of retail value.

Storage Cost. Storage cost of apples was taken from a 1974 study by Lee.⁸ His findings are not out of date with the data used in this study. For both regular storage (RS) and CA storage the cumulative seasonal costs for storing apples at monthly intervals were computed by Lee for a storage facility of 100,000 carton capacity (Appendix D).

Cost figures were derived with the assumption that all the apples would be removed from storage at the end of each month. RS was based on 150 days of storage and CA storage on 240 days. A minimum storage period of 90 days is generally required by law before apples are sold as CA storage.⁹

Growers' Net Return. The growers' net return was obtained by subtracting the total storage cost from growers' gross return. The net return is what the grower had left to pay for production and marketing costs, excluding storage cost.

ANALYSIS OF SOLUTIONS AND ALTERNATIVES

The season used in the study contained nine months, October to June, which involves the marketing of fall apples. Since Washington and West Virginia were the two largest suppliers of apples in the Baltimore wholesale market, their

⁶Growers' gross return is the amount of money the grower receives.

⁷Burns, *loc. cit.*

⁸Gregory Lee and Robert L. Jack, *Economic Analysis of Controlled Atmosphere Apple Storage*, West Virginia University Agricultural Experiment Station, Bulletin 634 (Morgantown, West Virginia: College of Agriculture and Forestry, November 1974).

⁹*Ibid.* pp. 5-11.

TABLE 1
Annual Unloads of Apples in Baltimore Wholesale Market Broken into
Fall and Spring Markets, 1967-73^a

Year	Washington		West Virginia		Others	
	Pounds	Percent of Total	Pounds	Percent of Total	Pounds	Percent of Total
<i>Fall</i>						
1967	2,265,250	36	6,098,750	82	9,200,400	70
1968	1,672,800	31	7,004,850	83	8,782,200	63
1969	2,230,400	34	8,259,450	87	9,026,150	64
1970	1,966,050	31	4,527,950	72	8,783,900	68
1971	1,453,500	29	5,316,750	73	8,109,000	68
1972	2,830,500	50	3,748,500	72	6,923,250	70
1973	3,251,000	53	2,371,500	78	5,699,250	69
<i>Spring</i>						
1967	3,972,900	64	1,414,300	18	4,321,400	30
1968	3,659,250	69	1,394,000	17	5,053,250	37
1969	4,251,700	66	1,219,750	13	5,122,950	36
1970	4,437,000	69	1,759,500	28	4,092,750	32
1971	3,519,000	71	1,950,750	27	3,825,000	32
1972	2,830,500	50	1,453,500	28	3,021,750	30
1973	2,869,000	47	688,500	22	2,601,000	31

^aUnited States Department of Agriculture, *Fresh Fruit and Vegetable Unloads in Eastern Cities, 1967-73* (Washington, D.C.: Consumer and Marketing Service, Fruit and Vegetable Division, Market News Branch)

quantities were listed separately; all other states were included in the "other" category.

Over the past 20 years West Virginia growers have faced increased competition from other states selling fresh apples in eastern markets. During this time, the seasonal market pattern for Appalachian growers has changed very little. West Virginia, Virginia, and North Carolina continue to unload large quantities of apples early in the season, while Washington, New York, and Michigan increase their marketings late in the season.¹⁰ As shown in Table 1, West Virginia producers did make some changes in their marketing pattern around

¹⁰Desmond O'Rourke, *Recent Trends in Costs, Marketing Margins and Prices of Washington Apples*, Washington Agricultural Experiment Station, College of Agriculture, Washington State University, Circular 560, January 1973, p. 16.

1970. Washington continued marketing a lower percentage in the fall market and a higher percentage in the spring market until 1972 and 1973. Other states have continued to use the same marketing pattern for all of the years. Washington and West Virginia account for nearly 50 percent of the unloads in the Baltimore market, while other states make up the remainder.

Normal Marketing Pattern - Solution I

In the normal marketing pattern solution (Solution I), storage cost and five-year average monthly data for volume, retail price, marketing margin, and growers' return were determined for apples sold by all states in the Baltimore fresh market. West Virginia growers marketed 5,052,000 pounds for an average season. The monthly quantity for the average season ranged from a low of 38,000 pounds in June to a high of 1,098,000 pounds in October (Table 2). The usual marketing pattern during a season showed a large quantity of sales soon after harvest, diminishing through the winter and spring months. This pattern of marketing was found to be consistent over time for West Virginia and other Appalachian District states.

The five-year average retail price per thousand pounds in Baltimore ranged from a low of \$207 in November to a high of \$276 in June, with an average seasonal retail price of \$231. At these prices, total retail value for the 5,052,000 pounds of West Virginia apples sold in the Baltimore market was \$1,123,275. West Virginia growers' gross return was \$597,308. After subtracting \$41,907 for storage cost, the growers' net return was \$555,401, or \$110 per thousand pounds. On a monthly basis, the growers' net return in October was \$122,419. It declined to \$5,525 in June.

Reversed Marketing Pattern - Solution II

The seasonal marketing pattern used for West Virginia in Solution I was reversed for the analysis in Solution II. Reversed market pattern means marketing June's quantity in October, while October's quantity was marketed in June. The same annual quantity of 5,052,000 pounds was maintained, but increased CA storage capacity was needed in order for this market pattern to be feasible. For this solution, the monthly quantity ranged from a low of 38,000 pounds in October to a high of 1,098,000 pounds in June (Table 3). The marketing pattern followed during this season was one with low sales soon after harvest and high volume sales in the spring. Price flexibility coefficients were used to adjust retail price due to changes in quantity. The five-year average seasonal retail price was \$232 per thousand pounds. Retail prices ranged from a low of \$217 in November to a high of \$272 per thousand pounds in June. Total retail value of the apple sales for the season was \$1,200,346.

West Virginia growers' gross return amounted to \$653,109. After subtracting \$46,549 for storage cost, the growers' net return was \$606,561 or

TABLE 2

Five-Year Average Analysis of Fresh Apples Sold in Baltimore Wholesale Market, with Monthly Volume, Retail Value, Storage Cost, and Growers' Return to West Virginia Based on Normal Marketing Pattern (Solution I of the Model), 1969-73^a

Month	WV Avg. Mo. Vol.	Retail Price Per 1,000 Pounds	Total Retail Value	Growers' Share Retail Value	Growers' Gross Return	Cumulative Storage Cost Per 1,000 Pounds	Total Storage Cost	Growers' Net Return
	<i>1,000 lbs.</i>	<i>Dollars</i>		<i>Percent</i>		<i>Dollars</i>		
Oct.	1,098	\$225	\$ 247,057	53.0	\$130,940	\$ 7.76	\$ 8,521	\$122,419
Nov.	799	207	165,463	53.2	88,027	7.76	6,203	81,824
Dec.	807	223	179,959	52.8	95,018	8.00	6,456	88,562
Jan.	626	219	137,193	54.0	74,084	8.00	5,012	69,072
Feb.	591	218	128,932	51.6	66,529	8.24	4,873	61,655
Mar.	510	227	115,770	51.4	59,506	9.41	4,799	54,707
Apr.	391	231	90,321	55.8	50,399	9.65	3,773	46,626
May	191	252	48,024	56.0	26,893	9.88	1,883	25,010
June	38	276	10,557	56.0	5,912	10.12	387	5,525
Total	5,052		\$1,123,275		\$597,308		\$41,907	\$555,401
Average		\$231		53.7		\$ 8.76		

^aCalculations in Appendix E.

TABLE 3

Five-Year Average Analysis of Fresh Apples Sold in Baltimore Wholesale Market, with Monthly Volume, Retail Value, Storage Cost and Growers' Return to West Virginia Based on Reversed Marketing Pattern (Solution II of the Model), 1969-73^a

Month	WV Avg. Mo. Vol.	Retail Price Per 1,000 Pounds	Total Retail Value	Growers' Share Retail Value	Growers' Gross Return	Cumulative Storage Cost Per 1,000 Pounds	Total Storage Cost	Growers' Net Return
	1,000 lbs.		Dollars	Percent			Dollars	
Oct.	38	\$238	\$ 9,108	53.0	\$ 4,827	\$ 7.76	\$ 297	\$ 4,530
Nov.	191	217	41,348	53.2	21,997	7.76	1,479	20,518
Dec.	391	228	89,164	52.8	47,078	8.00	3,128	43,950
Jan.	510	221	112,526	54.0	60,764	8.00	4,080	56,684
Feb.	591	218	128,932	51.6	66,529	8.24	4,873	61,655
Mar.	626	226	141,540	51.4	72,751	9.41	5,895	66,857
Apr.	807	227	183,041	55.8	102,137	9.65	7,787	94,350
May	799	245	195,902	56.0	109,705	9.88	7,897	101,808
June	1,098	272	298,785	56.0	167,320	10.12	11,112	156,208
Total	5,052		\$1,200,346		\$653,109		\$46,549	\$606,561
Average		\$232		53.7		\$ 8.76		

^a Calculated in Appendix F.

\$120 per thousand pounds. In October it was \$4,530, increasing to \$156,208 by June.

Even Marketing Patterns - Solution III

In this solution, West Virginia's annual quantity of 5,052,000 pounds was divided by nine to obtain an even monthly quantity of 561,000 pounds sold in the Baltimore market. Changing West Virginia's marketing pattern to an even monthly distribution eliminated the problem of a large number of unloads early in the season, as in past seasons, or late in the season as in Solution II.

Retail price was adjusted by price flexibility coefficients to account for changes in quantity. The five-year average retail price per thousand pounds ranged from a low of \$211 in November to a high of \$274 in June, with an average seasonal retail price of \$232. Total retail value was \$1,107,180 (Table 4).

West Virginia growers' gross return was \$630,028. Subtracting storage costs of \$44,245 left growers a net return of \$585,783, or \$116 per thousand pounds. On a monthly basis, the growers' net return was \$58,626 in November, increasing to \$80,476 in June.

This even marketing pattern (Solution III) solution served as the basis for determining the impact the three following alternatives would have on West Virginia growers' net return.

Washington Quantity Decreased - Alternative I

After apple sales from West Virginia were placed on an even monthly marketing pattern (Solution III) in the Baltimore market, the impact of a change in Washington apple unloads on the market price was analyzed in Alternative I. The quantity from Washington was decreased each month by ten percent below the five-year average for that month. West Virginia still followed the same even market pattern of 561,000 pounds per month. The monthly quantity other states unloaded in the Baltimore market remained unchanged from the five-year average used in the basic model.

The first effect was an increase in retail prices each month. Price flexibility coefficients were used to adjust retail price due to change in quantity. The five-year average retail prices ranged from a low of \$212 per thousand pounds in November to a high of \$274 per thousand pounds in June, with an average seasonal retail price of \$232. The increased retail prices resulted in a total value of \$1,173,307 for West Virginia apples sold (Table 5).

Total annual growers' gross return was \$631,731. After subtracting storage costs of \$44,245, growers' net return for the season was \$587,487, or \$116 per thousand pounds. The lowest return was \$58,856 in November; the highest was \$80,527 in June.

TABLE 4

Five-Year Average Analysis of Fresh Apples Sold in Baltimore Wholesale Market, with Monthly Volume, Retail Value, Storage Cost and Growers' Return to West Virginia Based on Even Marketing Pattern (Solution III of the Model), 1969-73^a

Month	WV Avg. Mo. Vol.	Retail Price Per 1,000 Pounds	Growers',		Growers', Gross Return	Cumulative Storage Cost Per 1,000 Pounds	Total Storage Cost	Growers', Net Return
			Total Retail Value	Share Retail Value				
			Dollars	Percent	Dollars			
Oct.	561	\$232	\$ 130,034	53.0	\$ 68,918	\$ 7.76	\$ 4,356	\$ 64,562
Nov.	561	211	118,387	53.2	62,982	7.76	4,356	58,626
Dec.	561	226	126,852	52.8	66,978	8.00	4,491	62,487
Jan.	561	220	123,500	54.0	66,663	8.00	4,491	62,172
Feb.	561	218	122,591	51.6	63,257	8.24	4,625	58,632
Mar.	561	227	127,160	51.4	65,360	9.41	5,232	60,078
Apr.	561	229	128,710	55.8	71,320	9.65	5,417	66,403
May	561	248	139,094	56.0	77,893	9.88	5,546	72,347
June	561	274	153,852	56.0	86,157	10.12	5,681	80,476
Total	5,052		\$1,170,180		\$630,028		\$44,245	\$585,783
Average		\$232		53.7		\$ 8.76		

^aCalculations in Appendix G.

TABLE 5
Five-Year Average Analysis of Fresh Apples Sold in Baltimore Wholesale Market, with Washington
Decreased Ten Percent Each Month, Monthly Volume, Retail Value, Storage Cost and Growers'
Return to West Virginia Based on Even Marketing Pattern
(Alternative 1), 1969-73^a

Month	WV Avg. Mo. Vol.	Retail Price Per 1,000 Pounds	Total Retail Value	Growers' Share Retail Value	Growers' Gross Return	Cumulative Storage Cost Per 1,000 Pounds	Total Storage Cost	Growers' Net Return
	<i>1,000 lbs.</i>		<i>Dollars</i>	<i>Percent</i>			<i>Dollars</i>	
Oct.	561	\$232	\$ 130,259	53.0	\$ 69,037	\$ 7.76	\$ 4,356	\$ 64,681
Nov.	561	212	118,819	53.2	63,212	7.76	4,356	58,856
Dec.	561	227	127,144	52.8	67,132	8.00	4,491	62,641
Jan.	561	220	123,848	54.0	66,878	8.00	4,491	62,387
Feb.	561	220	123,107	51.6	63,523	8.24	4,625	58,898
Mar.	561	227	127,508	51.4	65,539	9.41	5,282	60,257
Apr.	561	230	129,125	55.8	72,052	9.65	5,417	66,635
May	561	249	139,555	56.0	78,151	9.88	5,546	72,605
June	561	274	153,942	56.0	86,207	10.12	5,681	80,527
Total	5,052		\$1,173,307		\$631,731		\$44,245	\$587,487
Average		\$232		53.7		\$ 8.76		

^aCalculated in Appendix H.

Washington Quantity Increased - Alternative II

In this alternative, Washington growers' quantity for each month was increased ten percent over the five-year average for that month. Again, West Virginia maintained an even monthly quantity of 561,000 pounds (Table 6). All other states continued the five-year average past market pattern used in the basic model.

The effect on the retail prices was a decline in price each month. This effect, due to quantity change, was adjusted by a price flexibility coefficient each month. The low month was November with a price of \$210 per thousand pounds, and the high month was June with \$274 per thousand pounds. Seasonal average retail price was \$231 per thousand pounds. At these prices, total retail value for West Virginia apples sold in the Baltimore market was \$1,166,953.

West Virginia growers' gross return was \$628,324. After subtracting \$44,245 for storage cost from growers' gross return, a total of \$584,080, or \$116 per thousand pounds, was left for growers' net return. Monthly net return increased from a low of \$58,365 in February to a high of \$80,426 in June.

West Virginia Quantity Increased - Alternative III

Washington growers' impact on market price has been analyzed in Alternatives I and II. West Virginia growers' impact on the market price was analyzed in this alternative. Each month West Virginia's quantity was increased ten percent over the five-year average even-monthly pattern used in Solution III. This increased West Virginia's annual total quantity to 5,557,000 (Table 7). Although West Virginia maintained an even monthly market pattern with 617,000 pounds per month, Washington and other states continued the five-year average past marketing pattern and volume use in the basic model.

The five-year average retail price increased from a low of \$210 per thousand pounds in November to a high of \$274 per thousand pounds in June, with an average seasonal retail price of \$231. Total retail value at these prices was \$1,283,510 for West Virginia apples sold in the Baltimore fresh market. Although the retail prices declined overall, the increase in quantity marketed each month offset the effect of the price decline. Price flexibility coefficients were used to adjust retail price due to changes in quantity.

West Virginia growers' gross return was \$691,090 and storage cost increased to \$48,669 with the increase in quantity. After subtracting storage cost from growers' gross return, a total of \$642,421, or \$116 per thousand pounds was obtained for growers' net return. On a monthly basis, the growers' net return in November was \$64,149 and \$88,475 in June.

Comparison of Solutions and Alternatives

In comparing Solutions for the model, the reversed marketing pattern (Solution II) had the largest net return because a large proportion of the sales

TABLE 6

Five-Year Average Analysis of Fresh Apples Sold in Baltimore Wholesale Market, with Washington Increased Ten Percent Each Month, Monthly Volume, Retail Value, Storage Cost and Growers' Return to West Virginia Based on Even Marketing Pattern
(Alternative II), 1969-73^a

Month	WV Avg. Mo. Vol.	Retail Price Per 1,000 Pounds	Total Retail Value	Growers' Share Retail Value	Growers' Gross Return	Cumulative Storage Cost Per 1,000 Pounds	Total Storage Cost	Growers' Net Return
	<i>1,000 lbs.</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Percent</i>			<i>Dollars</i>	
Oct.	561	\$231	\$ 129,810	53.0	\$ 68,799	\$ 7.76	\$ 4,356	\$ 64,443
Nov.	561	210	117,954	53.2	62,752	7.76	4,356	58,396
Dec.	561	225	126,560	52.8	66,824	8.00	4,491	62,333
Jan.	561	219	123,051	54.0	66,448	8.00	4,491	61,957
Feb.	561	217	122,075	51.6	62,991	8.24	4,625	58,365
Mar.	561	226	126,812	51.4	65,182	9.41	5,282	59,899
Apr.	561	229	128,294	55.8	71,588	9.65	5,417	66,171
May	561	247	138,634	56.0	77,635	9.88	5,546	72,089
June	561	274	153,762	56.0	86,107	10.12	5,681	80,426
Total	5,052		\$1,166,953		\$628,324		\$44,245	\$584,080
Average		\$231		53.7		\$ 8.76		

^aCalculations in Appendix I.

TABLE 7
Five-Year Average Analysis of Fresh Apples Sold in Baltimore Wholesale Market, with Monthly
Volume, Retail Value, Storage Cost and Growers' Return to West Virginia Based on Even
Marketing Pattern Increased Ten Percent Each Month
(Alternative III), 1969-73^a

Month	WV Avg. Mo. Vol.	Retail Price Per 1,000 Pounds	Total Retail Value	Growers' Share Retail Value	Growers' Gross Return	Cumulative Storage Cost Per 1,000 Pounds	Total Storage Cost	Growers' Net Return
			<i>Dollars</i>	<i>Percent</i>			<i>Dollars</i>	
	<i>1,000 lbs.</i>							
Oct.	617	\$231	\$ 142,512	53.0	\$ 75,531	\$ 7.76	\$ 4,792	\$ 70,740
Nov.	617	210	129,588	53.2	68,941	7.76	4,792	64,149
Dec.	617	225	139,073	52.8	73,430	8.00	4,940	68,491
Jan.	617	219	135,294	54.0	73,059	8.00	4,940	68,119
Feb.	617	218	134,392	51.6	69,346	8.24	5,088	64,259
Mar.	617	226	139,567	51.4	71,737	9.41	5,810	65,927
Apr.	617	229	141,259	55.8	78,822	9.65	5,959	72,864
May	617	247	152,676	56.0	85,498	9.88	6,101	79,398
June	617	274	169,150	56.0	94,724	10.12	6,249	88,475
Total	5,557		\$1,283,510		\$691,090		\$48,669	\$642,421
Average		\$231		53.7		\$ 8.76		

^aCalculations in Appendix J.

were in the spring market season when prices are normally higher. The second largest net return occurred when the even monthly marketing pattern (Solution III) for West Virginia apples was followed (Table 8). Since the purpose of this study was to determine if the net return to West Virginia growers would be increased by changing to a more even distribution of apples over the entire market season, Solution III (even monthly distribution) was selected as the basis for comparison. The alternatives were various manipulations of quantities marketed by West Virginia and Washington to determine the effect on market price and on net return to West Virginia growers.

The impact of a smaller volume of Washington apples on the market price and on West Virginia growers' net return was considered in Alternative I. West Virginia unloads followed an even market pattern, and other states maintained the five-year average past market volume. Decreasing the volume of Washington apples increased West Virginia growers' total net return by \$1,704, but no change occurred in net return per thousand pounds. Furthermore, the increase in Washington's and West Virginia's volume in Alternatives II and III, respectively, did not change the net return per thousand pounds from that obtained in Solution III.

The analysis of Solution III and Alternative III showed adjusted net return could be increased by a more even distribution of apples over the entire market season. Another aspect which was not analyzed in this study, but which might increase adjusted net return, is a combination of Solution II and Alternative III.

TABLE 8
Comparison of Five-Year Average Net Return Between
the Model Solutions and Alternatives, Baltimore
Market, 1969-73

The Model	Net Return	
	Total	Per 1,000 Pounds
Normal Marketing Pattern (Solution I)	\$555,401	\$110
Reversed Marketing Pattern (Solution II)	606,561	120
Even Marketing Pattern (Solution III)	585,783	116
Washington Quantity Decreased (Alternative I)	587,487	116
Washington Quantity Increased (Alternative II)	584,080	116
West Virginia Quantity Increased (Alternative III)	642,421	116

CONCLUSIONS

West Virginia producers selling apples in the Baltimore fresh market are not maximizing total net return. In order to get a maximum net return, the growers should market a smaller quantity of apples in the fall market and a larger quantity in the spring market. Of the solutions and alternatives analyzed in this study, a combination of a more even distribution throughout the season (Solution III) and a ten percent increase in volume (Alternative III) unloaded in the Baltimore fresh market would be the best market pattern for West Virginia growers. Establishing this market pattern would involve more extensive use of CA storage than presently exists in West Virginia.

IMPLICATIONS

Adjustments that are made by one growing area affect growers in all other areas. With a situation where supply is increasing and demand is fairly constant, the growers must market their apple crop strategically in order to get maximum net return from sales. Also, a further suggested study dealing with market pattern shifts and impact on the growers' net return in the future years would be of interest. A study of this nature would be useful to West Virginia growers in predicting the reaction of growers in other areas to various changes in West Virginia market pattern.

West Virginia growers are not presently following the market pattern which would give the greatest net return. Under the assumptions used in this study, West Virginia could avoid the heavy sales at low prices in the fall by accepting a small increase in storage cost and switching marketing patterns. This shift in marketing pattern is essential to prevent losing sales to other growing areas and to stay competitive in the market place. This study dealt with only the Baltimore market. If the results from this analysis were applied to West Virginia fresh apples sold in all markets, the increase in net return would be much larger.

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APPENDIX

APPENDIX A
Five-Year Average Estimated
Retail Apple Prices in Baltimore, 1969-73^a

Month	1969	1970	1971	1972	1973	Monthly Average
<i>Cents per Pound</i>						
Oct.	26.9	21.3	18.7	20.6	25.0	22.5
Nov.	19.3	20.2	18.3	20.4	25.3	20.7
Dec.	19.9	18.9	20.3	26.6	25.9	22.3
Jan.	21.2	18.8	21.7	20.3	27.6	21.9
Feb.	21.8	19.5	17.3	21.3	29.2	21.8
Mar.	23.2	19.2	20.6	20.4	29.9	22.7
Apr.	22.5	21.5	19.5	22.1	29.8	23.1
May	23.7	22.8	21.3	24.2	33.9	25.2
June	25.2	26.4	24.7	25.5	36.3	27.6
Yearly Average	22.6	21.0	20.3	22.4	29.2	

^aUnited States Department of Labor, *Estimated Retail Food Prices by Cities, 1964-74* (Washington, D. C.: Bureau of Labor Statistics)

APPENDIX B
Price Flexibilities for Fresh Apples, by Period for
Selected Seasons, 1963-64—1968-69^a

Season	Periods			
	I Sep.-Nov.	II Dec.-Feb.	III Mar.-May	IV June-Aug.
1963-64	-0.4512	-0.3634	-0.2376	-0.0497
1966-67	- .4249	- .3432	- .2255	- .0475
1968-69	- .3727	- .3031	- .2012	- .0431

^aVictor G. Edman, *Retail Demand for Fresh Apples*, Economic Research Service, Marketing Research Report 952 (Washington, D.C.: United States Department of Agriculture, April 1972), pp. 12-13

APPENDIX C
Grower and Packer Share of Retail Value in New York City,
1969-73^a

Month	Year					Avg.
	1969	1970	1971	1972	1973	
Percent						
Oct.						
WA	40	44	51	44	41	44.0
East ^b	48	47	N.P. ^e	64	53	53.0
Nov.						
WA	33	42	50	43	37	41.0
East	44	54	55	62	51	53.2
Dec.						
WA	34	43	44	46	40	41.4
East	40	55	52	65	52	52.8
Jan.						
WA	32	42	43	48	38	40.6
East	37	60	52	69	52	54.0
Feb.						
WA	32	42	43	46	35	39.6
East	45	62	53	54	44	51.6
Mar.						
WA	32	44	44	45	36	40.2
East	39	57	48	58	55	51.4
Apr.						
WA	39	49	48	49	41	45.2
East	51	47	57	68	56	55.8
May						
WA	38	46	48	48	37	43.4
East	49	63	62	65	42	56.0
June						
WA	39	44	45	46	46	44.0
East	49 ^c	55 ^c	52 ^c	63 ^c	61 ^c	56.0 ^c
Avg.						
WA	35.4	44.0	46.2	46.1	39.0	
East	44.6	55.6	47.9 ^d	63.1	51.8	

^a Alfred J. Burns and Joseph C. Podany, *Prices and Spreads for Selected Fruits Sold Fresh in Major Markets, 1967-68-1973-74*, Economic Research Service, Agricultural Economic Report No. 295 (Washington, D.C.: United States Department of Agriculture, August 1975) pp. 3-25

^b East percentages include West Virginia and other states.

^c Data were not available. Computed as average in comparison to other years

^d Computed on eight months

^e Not published

APPENDIX D
Estimated Cumulative Storage Cost for a 100,000 Carton
Regular and Controlled Atmosphere Storage Facility

Month	Cost Per Carton		Cost Per Pound		Cost Per 1,000 Pounds	
	RS	CA	RS	CA	RS	CA
Oct.	\$.33	\$.36	\$.0077647	\$.0084705	\$7.76	\$ 8.47
Nov.	.33	.37	.0077647	.0087058	7.76	8.71
Dec.	.34	.38	.008	.0089411	8.00	8.94
Jan.	.34	.39	.008	.009176	8.00	9.18
Feb.	.35	.39	.0082352	.009176	8.24	9.18
Mar.		.40		.0094117		9.41
Apr.		.41		.009647		9.65
May		.42		.0098823		9.88
June		.43 ^b		.010117 ^b		10.12 ^b

^aLee, Gregory and Robert L. Jack, Economic Analysis of Controlled Atmosphere Apple Storage, West Virginia University Agricultural Experiment Station, Bulletin 634. Morgantown, West Virginia: College of Agriculture and Forestry, November 1974, p. 11

^bEstimated by the researcher

APPENDIX E
Five-Year Average Quantities of Fresh Apples Sold in
Baltimore Market From All Sources, October to June
(Solution I of the Model), 1969-73

Month	Source				Estimated
	WA	WV	Other States	Total	Retail Prices
	<i>1,000 Pounds</i>				<i>Per 1,000 Pounds</i>
Oct.	267	1,098	1,644	3,010	\$225
Nov.	420	799	1,055	2,275	207
Dec.	386	807	1,307	2,499	223
Jan.	488	626	1,040	2,155	219
Feb.	703	591	1,042	2,336	218
Mar.	696	510	998	2,204	227
Apr.	799	391	814	2,004	231
May	870	191	710	1,770	252
June	635	38	500	1,173	276
Total	5,264	5,052	9,111	19,427	

APPENDIX F

Five-Year Average Quantities of Fresh Apples Marketed in Baltimore Wholesale Market, with West Virginia Market Quantities Reversed^a, by Months, Other States' Sales as Actually Made and with Price Flexibility Included (Solution II of the Model), 1969-73

Month	Source			Total New	Total Uneven	Diff.	Change Percent	Price Flexibility ^b	Estimated Retail Price
	WA	WV	Other						
				1,000 Pounds			Per 1,000 Pounds		
Oct.	267	38	1,644	1,950	3,010	-1060.	35.21	-.3727	\$238
Nov.	420	191	1,055	1,666	2,275	- 609.	26.76	-.3727	217
Dec.	386	391	1,307	2,083	2,499	- 416.	16.64	-.3031	228
Jan.	488	510	1,040	2,039	2,155	- 116.	5.40	-.3031	220
Feb.	703	591	1,042	2,336	2,336	0.	0	-.3031	218
Mar.	696	626	998	2,320	2,204	116.	5.28	-.2012	226
Apr.	799	807	814	2,420	2,004	416.	20.76	-.2012	227
May	870	799	710	2,379	1,770	609.	34.39	-.2012	245
June	635	1,098	500	2,233	1,173	1060.	90.33	-.0431	272
Total	5,264	5,052	9,111	19,427	19,426				

^aReversed means taking June's quantity and marketing it in October and October's quantity in June.

^bPrice flexibility is the amount of change in the price in the opposite direction of a one percent change in quantity.

APPENDIX G
Five-Year Average Quantities of Fresh Apples Sold in the Baltimore Wholesale Market, with
West Virginia Sales on Equal Monthly Distribution, all Other Sales Volumes Unchanged,
and Price Flexibility Included (Solution III of the Model), 1969-73

Month	Source			Total New	Total Uneven	Diff.	Change	Price Flexibility	Estimated Retail Price
	WA	WV	Other						
	<i>1,000 Pounds</i>						<i>Percent</i>		<i>Per 1,000 Pounds</i>
Oct.	267	561	1,644	2,473	3,010	-537	17.83	-.3727	\$232
Nov.	420	561	1,055	2,037	2,275	-238	10.46	-.3727	211
Dec.	386	561	1,307	2,254	2,499	-246	9.83	-.3031	226
Jan.	488	561	1,040	2,090	2,155	- 65	3.02	-.3031	220
Feb.	703	561	1,042	2,306	2,336	- 30	1.29	-.3031	218
Mar.	696	561	998	2,255	2,204	51	2.33	-.2012	227
Apr.	799	561	814	2,174	2,004	170	8.50	-.2012	229
May	870	561	710	2,141	1,770	371	20.94	-.2012	248
June	635	561	500	1,696	1,173	523	44.59	-.0431	274
Total	5,624	5,052	9,111	19,427	19,427				

APPENDIX H

Five-Year Average Quantities of Fresh Apples Sold in Baltimore Wholesale Market, with Washington Decreased Ten Percent Each Month, West Virginia Even Distribution, Other States Remain Same and Price Flexibility Included (Alternative I), 1969-73

Month	Source			Total New	Total Even	Diff.	Change	Price Flexibility	Estimated Retail Price
	WA	WV	Other						
							Percent		Per 1,000 Pounds
Oct.	241	561	1,644	2,446	2,473	-27.	1.08	-.3727	\$232
Nov.	378	561	1,055	1,995	2,037	-42.	2.06	-.3727	212
Dec.	347	561	1,307	2,215	2,254	-39.	1.71	-.3031	227
Jan.	440	561	1,040	2,041	2,090	-49.	2.34	-.3031	221
Feb.	633	561	1,042	2,236	2,306	-70.	3.05	-.3031	219
Mar.	626	561	998	2,185	2,255	-70.	3.09	-.2012	227
Apr.	719	561	814	2,095	2,174	-80.	3.67	-.2012	230
May	783	561	710	2,054	2,141	-87.	4.06	-.2012	249
June	572	561	500	1,633	1,696	-64.	3.75	-.0431	274
Total	4,738	5,052	9,111	18,900	19,426				

APPENDIX I
Five-Year Average Quantities of Fresh Apples Sold in Baltimore Wholesale Market, with Washington
Increased Ten Percent Each Month, West Virginia Even Distribution, Other States
Remain Same and Price Flexibility Included (Alternative II), 1969-73

Month	Source			Total New	Total Even	Diff.	Change Percent	Price Flexibility	Estimated Retail Price
	WA	WV	Other						
	<i>1,000 Pounds</i>						<i>Percent</i>		<i>Per 1,000 Pounds</i>
Oct.	294	561	1,644	2,500	2,473	27	1.08	-.3727	\$231
Nov.	462	561	1,055	2,079	2,037	42	2.06	-.3727	210
Dec.	424	561	1,307	2,292	2,254	39	1.71	-.3031	225
Jan.	537	561	1,040	2,139	2,090	49	2.34	-.3031	219
Feb.	773	561	1,042	2,377	2,306	70	3.05	-.3031	217
Mar.	765	561	998	2,325	2,255	70	3.09	-.2012	226
Apr.	879	561	814	2,254	2,174	80	3.67	-.2012	229
May	957	561	710	2,228	2,141	87	4.06	-.2012	247
June	699	561	500	1,760	1,696	64	3.75	-.0431	274
Total	5,790	5,052	9,111	19,953	19,427				

APPENDIX J

Five-Year Average Quantities of Fresh Apples Sold in Baltimore Wholesale Market, with Washington and Other States with Five-Year Average, West Virginia Increased Ten Percent Each Month with Continued Even Distribution, and Price Flexibility Included (Alternative III), 1969-73

Month	Source			Total New	Total Even	Diff.	Change	Price Flexibility	Estimated Retail Price
	WA	WV	Other						
	<i>1,000 Pounds</i>						<i>Percent</i>		<i>Per 1,000 Pounds</i>
Oct.	264	617	1,644	2,529	2,473	56	2.27	-.3727	\$231
Nov.	420	617	1,055	2,093	2,037	56	2.76	-.3727	210
Dec.	386	617	1,307	2,310	2,254	56	2.49	-.3031	225
Jan.	488	617	1,040	2,146	2,090	56	2.69	-.3031	219
Feb.	703	617	1,042	2,363	2,306	56	2.43	-.3031	218
Mar.	696	617	998	2,311	2,255	56	2.49	-.2012	226
Apr.	799	617	814	2,231	2,174	56	2.58	-.2012	229
May	870	617	710	2,197	2,141	56	2.62	-.2012	247
June	635	617	500	1,752	1,696	56	3.31	.0431	274
Total	5,264	5,557	9,111	19,932	19,427				





